

UNITED STATES MARINE CORPS
Basic Officer Course
The Basic School
Marine Corps Combat Development Command
Quantico, Virginia 22134-5019

B2117

INTRODUCTION TO MORTARS**Student Handout****1. Characteristics**

a. Smooth bore. Infantry mortars do not use rifling in the barrel to provide stabilizing spin to the round. Stabilizing is provided by the effect of fins which are placed on the tail of the round.

b. Muzzle loaded. Unlike other small arms which are loaded from the breach, infantry mortars are loaded by placing the round into the barrel from the muzzle, tail end first.

c. High angle. Anything fired at an angle of 45 degrees or more above the horizontal.

(1) High maximum ordinate. Maximum ordinate is the maximum height the round will travel above the ground.

(2) Long time of flight. Due to the high angle of the trajectory the round takes much longer to impact.

2. **Indirect Fire.** Fire delivered on a target that is not itself used as a point of aim by the weapon or director.

3. Functioning

a. Insert round into the muzzle.

b. When released, gravity and the angle of the cannon allow the round to slide down to the base.

c. The firing pin strikes the primer which ignites the ignition cartridge.

d. The ignition cartridge ignites the increments.

e. Expanding gases create pressure that is trapped in the cannon by the body of the cartridge.

f. The pressure builds pushing the round out of the cannon.

4. Mortar Major Groups

a. Cannon. Launches the round.

b. Bipod/mount. Absorbs shock, provides stability, traverses and elevates the tube, eliminates cant.

c. Baseplate. Absorbs recoil and provides stability.

d. Sight. Aims the barrel for direction and elevation.

5. 60mm Mortar Organization

a. The 60mm mortar section is located in the weapons platoon of the infantry rifle company. It is the company commander's personal indirect fire support weapon.

b. Organization

(1) Platoon headquarters

(a) Platoon commander 1stLt or 2ndLt 0302

- (b) Platoon sergeant GySgt 0369
- (2) One section
 - (a) Section headquarters
 - (b) Section leader Sgt 0341
 - (c) Computes the data and can act as a forward observer.
- (3) Three mortar squads. (1 mortar and 3 Marines per squad.)
 - (a) Squad leader/gunner Cpl 0341
 - (b) Assistant gunner LCpl 0341
 - (c) Ammunition man Pvt/PFC 0341

6. **M224 60mm Lightweight Company Mortars**

a. The M224 60mm Mortar is a smoothbore, muzzle loaded, high angle of fire weapon. It can be fired from either a drop fire mode or a trigger fire mode. The M224 was adopted in 1982 to replace the M19 60mm mortar, giving the company mortar section increased capability in range and responsiveness. It can be fired in a direct mode or through the use of a fire direction center (FDC).

b. Nomenclature and general data

(1)	<u>Mortar weight</u>	
	Conventional mode	46.5 lbs
	Handheld	18.0 lbs
Cannon M225		14.41 lbs
Bipod M170		15.21 lbs
Sight M64		2.5 lbs
Baseplate M7		14.41 lbs
M8		3.6 lbs
With SL-3 components		76.6 lbs

(2) Rates of fire

- (a) Maximum 30 rounds per minute for four minutes.
- (b) Sustained 20 rounds per minute thereafter.

7. **Types of Ammunition.** There are five types of ammunition used with the 60mm Mortar.

- a. High explosive
- b. White phosphorus
- c. Illumination
- d. Practice
- e. Training

8. **60mm Mortar Ammunition**

- a. M888 high explosive
 Weight w/fuze 3.90 lbs
 Length w/fuze 14.71 in
 Bursting radius 27.5 meters
 Fuze M935
 Maximum range 3490 meters
 Color Olive drab w/yellow markings
- b. M720 high explosive
 Weight w/fuze 3.75 lbs
 Length 14.84 in
 Bursting radius 27.5 meters
 Fuze M734, M888
 Maximum range 3490 meters
 Color Olive drab w/yellow markings
- c. M722 white phosphorus
 Weight 3.75 lbs
 Length 14.84 in
 Bursting radius 10 meters x 10 meters
 Fuze M745
 Maximum range 3490 meters
 Color Light green w/light red markings and one yellow band
- d. M721 illumination
 Weight 3.75 lbs
 Length 16.85 in
 Maximum range 3200 meters (at burst)
 Burn time 40 seconds
 Candlepower 350,000
 Color White w/black markings

9. **81mm Mortar Organization**

a. The 81mm mortar platoon is located in the weapons company of the infantry battalion. It is the battalion commander's personal indirect fire support weapon.

b. Organization(1) Platoon headquarters

- (a) Platoon commander 1stLt 0302
 (b) Platoon sergeant GySgt 0848
 (c) Ammunition technician LCpl 2311
 (d) Ammo men/driver PFC 0341

(2) Two sections, section's headquarters

- (a) Section leader SSgt 0369
 (b) (2) Ammo men/driver LCpl 0341
 (c) (1) Plotter Sgt 0341
 (d) (1) Plotter/recorder Cpl 0341
 (e) (1) Recorder/driver LCpl 0341
 (f) (2) FWD observer Cpl 0341

(3) (8) Mortar squads, one squad

- | | | |
|-----|------------------|-----------|
| (a) | Squad leader | Sgt 0341 |
| (b) | Gunner | Cpl 0341 |
| (c) | Assistant gunner | LCpl 0341 |
| (d) | (3) Ammo men | Pvt 0341 |

10. **M252 81mm Mortar**

a. The M252 81mm Mortar is a smooth bore, muzzle loaded, high angle of fire weapon system. It is designed to be fired from the indirect fire mode and cannot be fired handheld. It normally utilizes an FDC. It has replaced the M29A1 81mm mortar.

b. General data

(1)	<u>Mortar weights</u>	
Cannon M253	35 lbs	
	Mount M177	27 lbs
Baseplate M3A1	25.5 lbs	
Sight M64A1	2.25 lbs	

(2) Rates of fire

- | | | |
|-----|-----------|---------------------------------------|
| (a) | Maximum | 30 rounds per minute for two minutes. |
| (b) | Sustained | 15 rounds per minute. |

11. **Types of Ammunition.** There are six types of ammunition used with the 81mm mortar.

- a. High explosive
- b. White phosphorus
- c. Red phosphorus
- d. Illumination
- e. Practice
- f. Training

12. **81mm Mortar Ammunition**a. M889 high explosive

Weight	8.96 lbs
Length	20.0 in
Color	Olive drab w/yellow markings
Bursting radius	40 meters x 30 meters
Components	Fuze, point detonating M935
Max. range	5733 meters

b. M821 high explosive

Weight	8.96 lbs
Length	20.1 in
Color	Olive drab w/yellow markings
Bursting radius	30 meters x 20 meters
Components	Fuze, multi-option M734
Max. range	5733 meters

c. M374A3 (M374A2E1) high explosive

Weight 8.96 lbs
 Length 20.0 in
 Color Olive drab w/yellow markings
 Bursting radius 30 meters x 20 meters
 Components Fuze, M567 or M524
 Max. range 5300 meters

d. M375A3 white phosphorus

Weight 9.05 lbs
 Length 20.0 in
 Color Light green w/light red and one yellow band
 Components Fuze, M567 or M524
 Max. range 4800 meters

e. M819 red phosphorus

Weight 10.6 lbs
 Length 25.0 in
 Color Light green w/black markings and one brown band
 Components Mechanical time M772
 Max. range 5000 meters (to airburst)

f. M301A3 illumination

Weight 10.1 lbs
 Length 24.7 in
 Color White w/black markings
 Illuminated area 1000 meters x 1000 meters
 Burn time 60 seconds
 Candlepower 360,000
 Max. range 2150 meters

g. M853A1 illumination

Weight 9.1 lbs
 Length 25.4 in
 Color White w/black markings
 Illuminated area 1000 meters x 1000 meters
 Burn time 60 seconds
 Candlepower 600,000
 Max. range 5100 meters

NOTE: An 81mm mortar section can cover 400 meters with a smoke screen.

13. **Fuze Types**

- a. Point detonating selective
- b. Multi-option
- c. Time

14. **Fuze Nomenclature**

- a. M935. PD Selective 60 or 81 HE
- b. M567/M526. PD Selective 81 HE, WP
- c. M524. PD Selective, impact or graze 81 HE, WP
- d. M734. Multi-option 60 or 81 HE
- e. M768/M84/M84A1. Time illumination
- f. M722. Time RP

15. **Indirect Fire Gunnery Team.** Consists of 3 elements; the observer (FO), the fire direction center (FDC) and the mortar line.

a. Forward observer (FO)

(1) Submits calls for fire to the fire direction center (FDC).

(2) Makes all subsequent adjustments.

b. Fire direction center (FDC)

(1) Receives calls for fire from the FO and computes necessary data using the plotting board and firing tables.

(2) The FDC uses a plotting board to compute deflection and range to target. It uses a large board with 1:25,000 grid boxes on it, with a clear circular wheel on top that can rotate 360 degrees. On this wheel are grid azimuths in mils from 0-6400 in a clockwise direction.

(3) The FDC takes the deflection and range and correlates the range in the firing tables (TFT). This gives them the elevation and the number of increments needed to send the round to the target. The firing tables will also give you the maximum ordinate and time of flight.

c. Mortar line. Receives instructions from the FDC and applies the appropriate data to the mortar rounds and the guns.

16. **Mortars in the Offense** - Mission: Provide close, continuous, indirect fire in support of maneuver elements.

a. The mortars participate as part of a larger force in the conduct of offensive operations; as such, mortars are an integral part of the attack. Mortars can be used to:

(1) Neutralize, suppress and destroy enemy forces.

(2) Deprive the enemy of resources or key terrain.

(3) Deceive and/or divert the enemy.

(4) Provide screening.

(5) Provide battlefield illumination.

b. Offensive operations are characterized by movement and changing situations. Flexibility in fire support is required to provide continuous fire. The mortar platoon or section plans to conduct fires enroute to the objective, on the objective and beyond the objective.

c. Mortars accomplish this by positioning near the line of departure (LD). The rule calls for having 1/2 to 2/3 of the mortar's maximum effective range fall forward of friendly troops.

d. In the offense, initial firing positions are prepared and ammunition may be stockpiled. Positions are occupied at the last moment before the attack. The platoon or section must remain ready throughout the attack to respond to call for fire and to displace, if necessary.

17. **Mortars in the Defense**

a. In the defense, mortars provide the maneuver commander organic indirect fire support as an integral part of the defense plan.

b. The commander and the fire support element plan to use mortars against enemy forces to suppress:

(1) Armored forces.

(2) Antiarmored guided missile systems.

- (3) Direct fire and overwatch positions.
- (4) Air defense weapons.
- (5) Indirect fire units supporting the attack.

c. Mortars are also used to provide both close defensive and final protective fires. These fires must be fully integrated into the commander's defensive scheme on the ground. When firing a FPF mortars will ordinarily, but not always, orient on the dead space of machine gun FPL's. These principles will be discussed in greater detail during Defensive Fundamentals II (B0339).

d. Whenever possible, mortar fires must be massed to reduce the mobility of the attacking force, and canalize it into designated engagement areas.

18. **Displacement of Mortars**

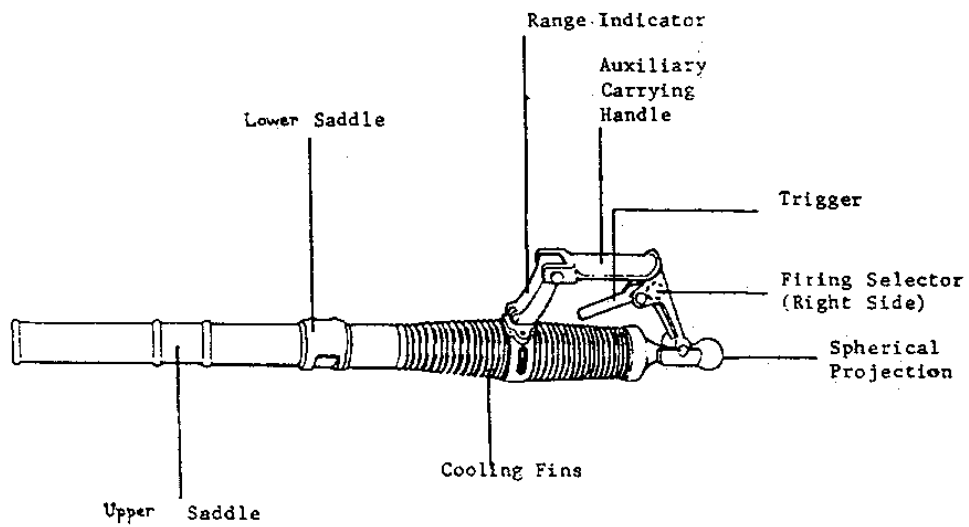
a. Mortars displace (move to a new firing position) to provide continuous fire support and to evade suppression. The mortars usually displace by echelon moving one or two squads at a time (60mm mortars) or section at a time (81mm mortars) to a new position so at least one mortar squad or section is in position to fire.

b. There are two methods that may be used to displace mortars; Successive Bounds and Alternate Bounds. The first echelon to move takes enough men and equipment to prepare the new position. When it is ready to accept calls for fire, it notifies the second echelon. The second echelon then displaces to join the first echelon (Successive Bounds) or to leapfrog past it to occupy another position (Alternate Bounds).

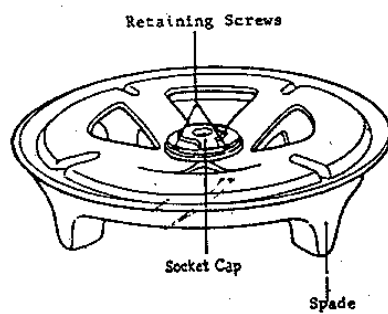
19. **Methods of Employment**

a. General support. The 81mm mortar platoon in support of the infantry battalion and the 60mm mortar section in support of the infantry company.

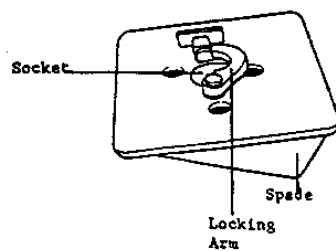
- b. Direct support. The 81mm mortar platoon or one section in support of a specific rifle company or the 60mm mortar section or one squad in support of a specific rifle platoon.
- c. Attachment. The 81mm mortar platoon or one section is placed temporarily within a rifle company and the 60mm mortar section or one squad placed temporarily within a rifle platoon.



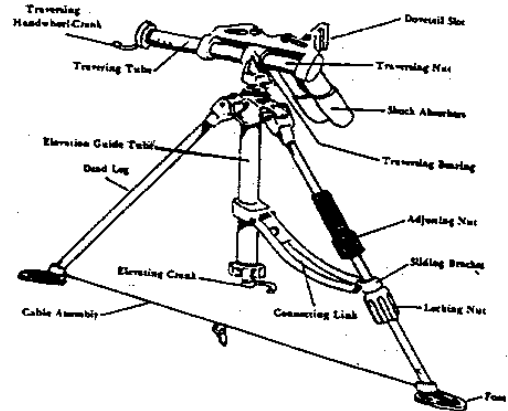
M225 CANNON



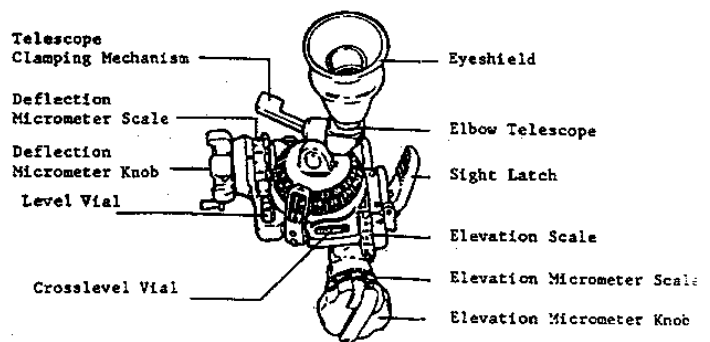
M7 BASEPLATE



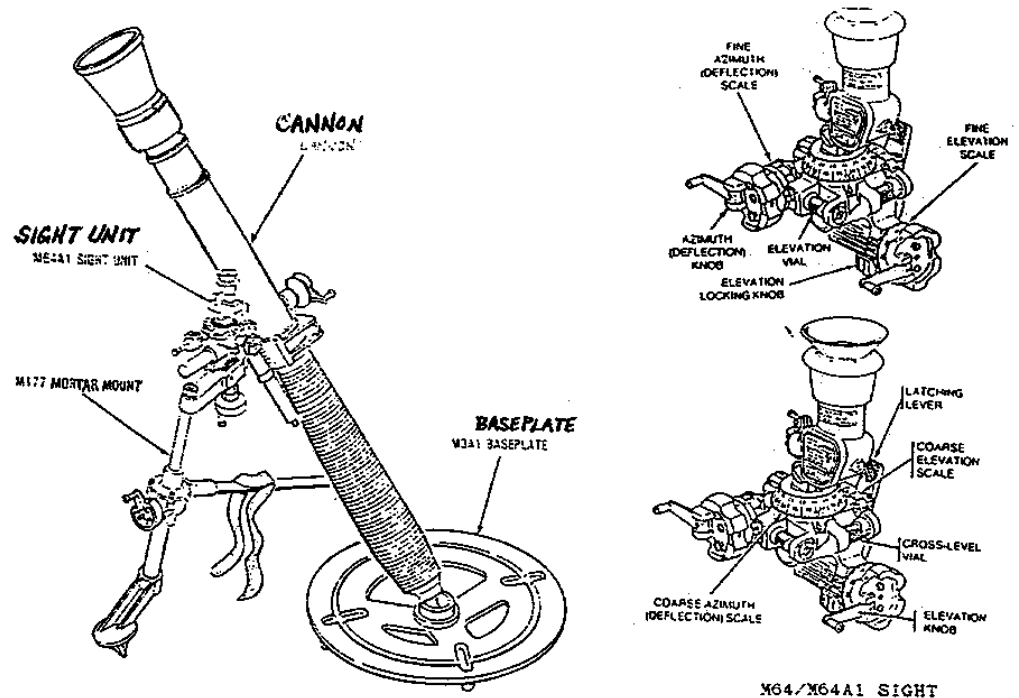
M8 BASEPLATE



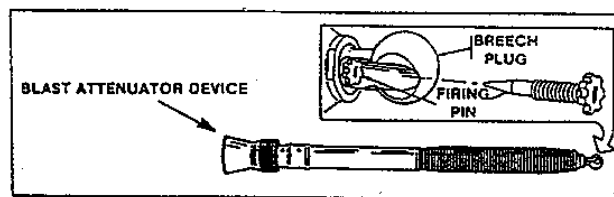
M170 BIPOD



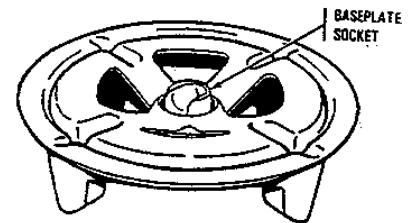
M64 SIGHT



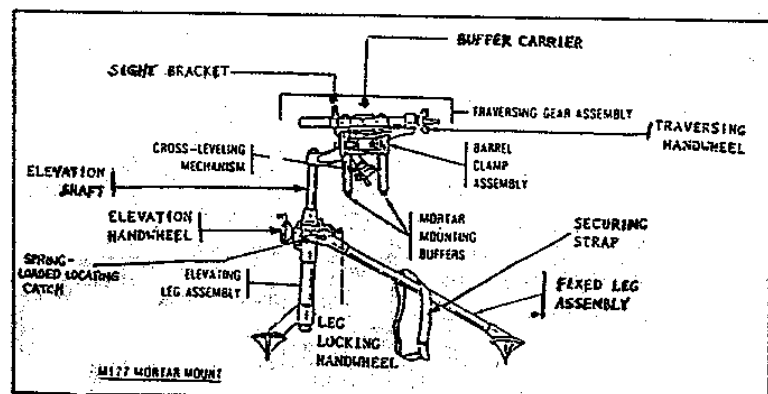
M252 81-MM MORTAR



M253 81MM CANNON



M3A1 BASEPLATE



M177 81MM MORTAR MOUNT

